Communications & Standards

Module 3

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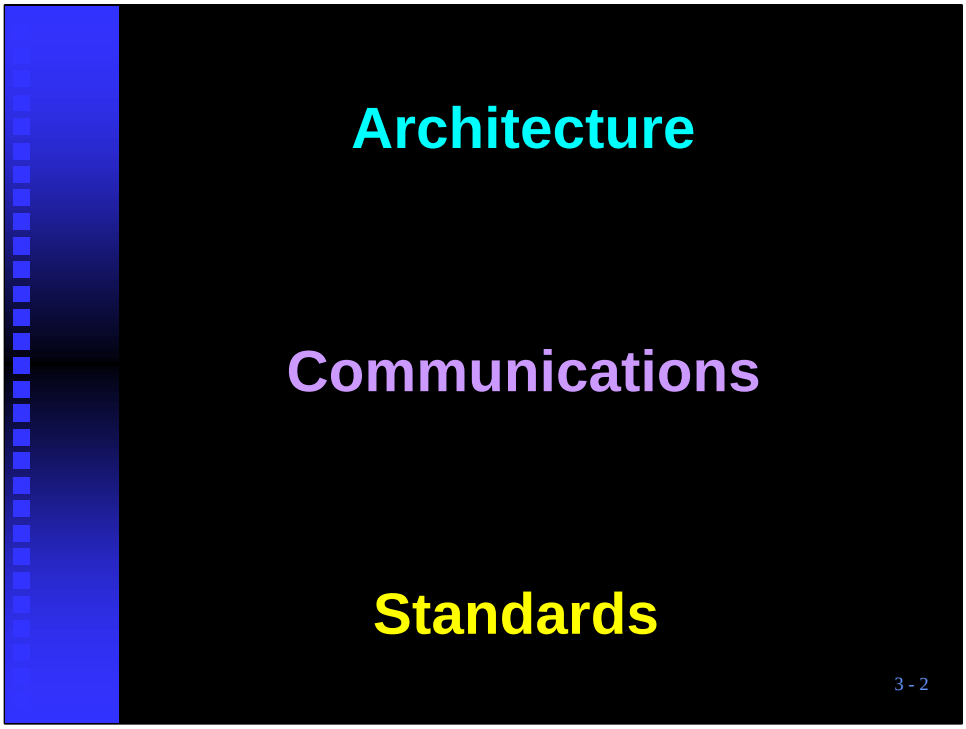
Architecture
Communications
Standards
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Module Goal

- To provide an overview of how the National ITS architecture:
  - drives communications needs
    - which in turn drive the need for standards in the transit community

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Module Outline

- Transit management communications
- What are standards?
- TCIP
- How ITS and the Architecture has created a need for standards

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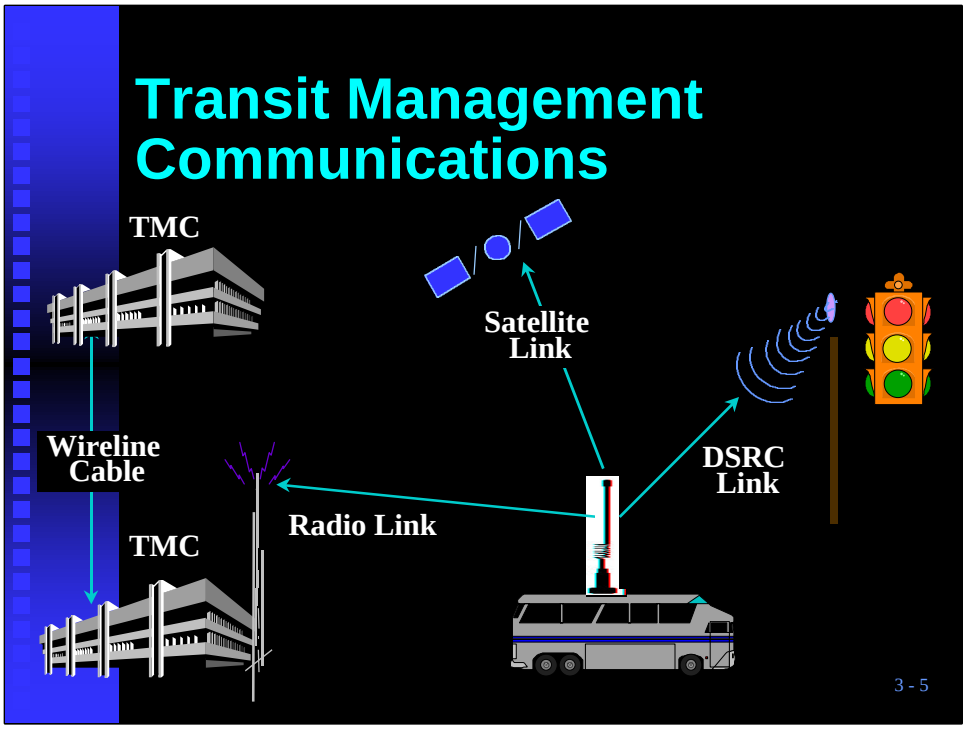
Transit Management Communications
TMC
Satellite Link
Wireline Cable
DSRC Link
Radio Link
TMC
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What Are Standards?

- Contain ITS technical specifications:
  - Rules, guidelines and definitions that ensure materials, products, processes or services are fit for their purposes
- Support the national architecture and promote:
  - Widespread use of ITS technology
  - Interoperability among ITS technologies

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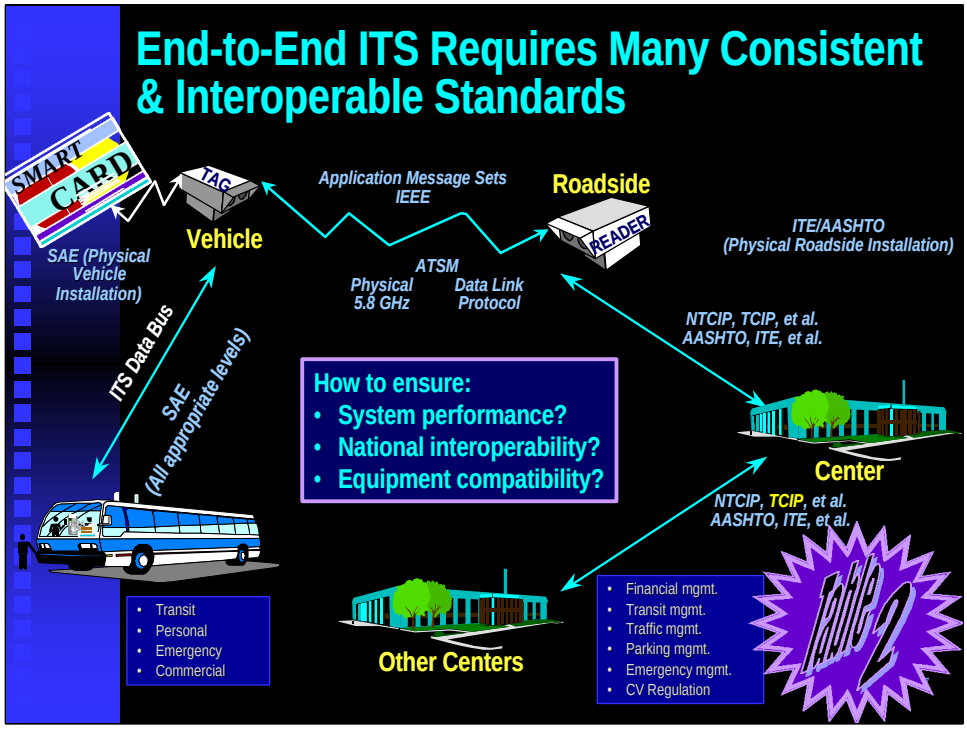
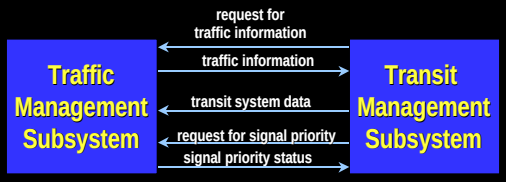

End-to-End ITS Requires Many Consistent & Interoperable Standards
SMART CARD
TAG
Vehicle
Application Message Sets
IEEE
Roadside
READER
ITE/AASHTO
(Physical Roadside Installation)
SAE (Physical Vehicle Installation)
ATSM
Physical
5.8 GHz
Data Link
Protocol
ITS Data Bus
SAE
(All appropriate levels)
NTCIP, TCIP, et al.
AASHTO, ITE, et al.
How to ensure:
• System performance?
• National interoperability?
• Equipment compatibility?
Center
NTCIP, TCIP, et al.
AASHTO, ITE, et al.
• Transit
• Personal
• Emergency
• Commercial
Other Centers
• Financial mgmt.
• Transit mgmt.
• Traffic mgmt.
• Parking mgmt.
• Emergency mgmt.
• CV Regulation
Table 2

Architecture and Standards

ITS Architecture



ITS Standards

- Transit Communications Interface Profiles
- Traffic Management Data Dictionary
- NTCIP Center to Center

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Transit Communications Interface Profiles (TCIP)

- Objective
  - Plug-and-Play compatibility
- Problem
  - Lack of open data interface standards
- Mission
  - Data interfaces among transit related applications
  - Data interfaces to ITS system data flows

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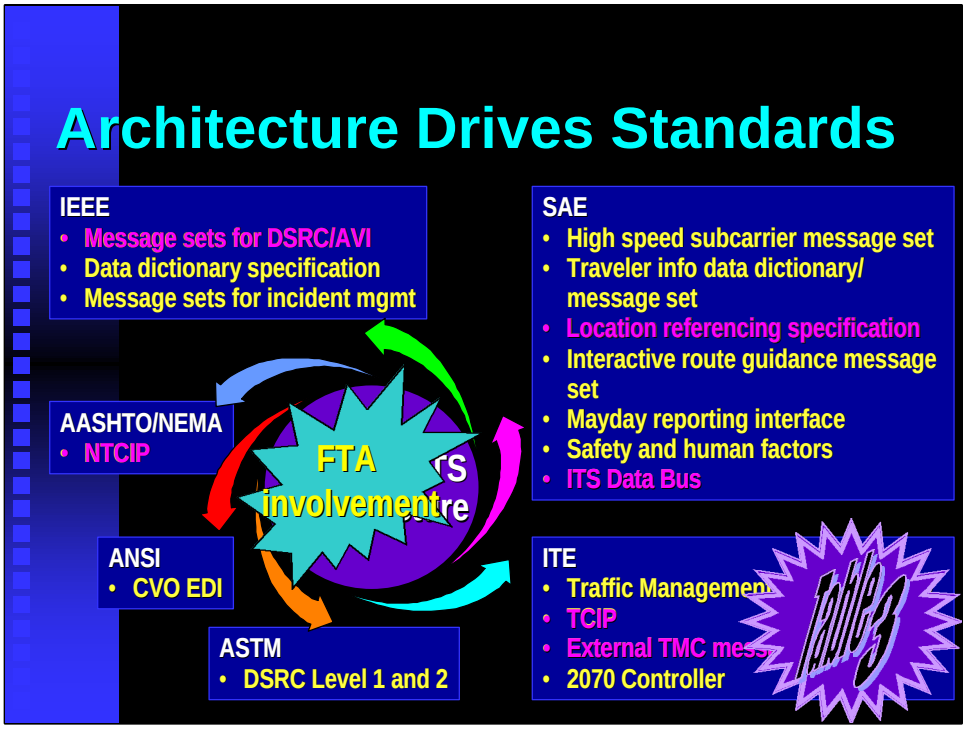
Architecture Drives Standards
IEEE
• Message sets for DSRC/AVI
• Data dictionary specification
• Message sets for incident mgmt
SAE
• High speed subcarrier message set
• Traveler info data dictionary/ message set
• Location referencing specification
• Interactive route guidance message set
• Mayday reporting interface
• Safety and human factors
• ITS Data Bus
AASHTO/NEMA
• NTCIP
FTA involvement
ANSI
• CVO EDI
ITE
• Traffic Management
• TCIP
• External TMC mess
• 2070 Controller
ASTM
• DSRC Level 1 and 2

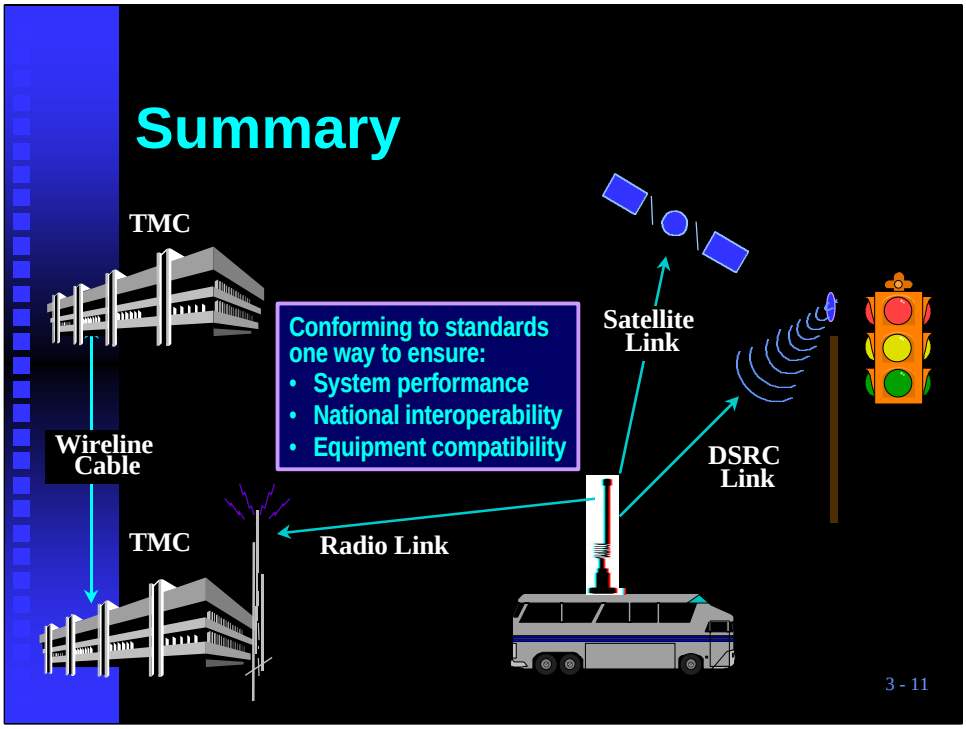
Summary
TMC
Wireline Cable
TMC
Conforming to standards one way to ensure:
• System performance
• National interoperability
• Equipment compatibility
Satellite Link
DSRC Link
Radio Link
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TABLE 2: THE ITS STANDARDS – FOUR TYPES	
	Description
1.	Message standards and message-related standards for ITS applications as defined by the National ITS Architecture
2.	Data dictionaries that define data elements in the messages
3.	Standards intended to meet the specific communications needs for ITS
4.	Infrastructure-related, safety, and human factor standards that address specific ITS requirements

TABLE 3: PROPOSED LIST OF CRITICAL STANDARDS			
Title of standard	**Project objective**	**Lead SDO/ criticality**	**Rationale**
ATIS Data Dictionary (Advanced Traveler Information System) [SAE J2353]. *Status: In ballot*	• Minimum set of medium-independent data elements for potential information service providers to deploy ATIS services • Basis for future interoperability of ATIS devices	SAE/ National	Enables service providers with conforming products to provide travel information to mobile users throughout the Nation.
ATIS Data Dictionary [SAE J2354]. *Status: In ballot*	• Basic message set using data elements from J2353 for potential information service providers to deploy ATIS services • Basis for future interoperability of ATIS devices	SAE/ National	*See above*
ATIS Message Structure for High Speed FM Subcarrier [SAE J2369] *Status: In ballot*	• General framework for cooperative transmission of ATIS data via FM Subcarrier • Preliminary coding/message structure for link travel time and network support functions for deployment of the standard modulation selected to meet ITS requirements • Establish efforts to develop additional messages beyond link travel times, e.g., transit schedules	SAE/ National	Allows mobile users with conforming products to access traveler information services uniformly throughout the Nation.
ATMS Data Dictionary (TMDD)—Sections 1 and 2 (Links/Nodes/Events) [TM 1.01] *Status: In ballot*	Functional-level data dictionary for ATMS. • Sect. 1 describes and standardizes roadway links and nodes in accordance with location referring message standard • Sect. 2: data elements for incidents and traffic disruptive roadway events	ITE/ Foundation	Used by ATIS for services to mobile users throughout the Nation: • location referencing and roadway basis for other TMDD sections • describe roadway for traveler information systems
ATMS Data Dictionary (TMDD)—Sections 3 and 4 (DMS/Video/Control/ Etc.) [TM 1.02]. *Status: In ballot*	• Sect. 3: data elements for traffic control, detectors, and modeling, actuated signal controllers, vehicle probes, and ramp metering data • Sect. 4: data elements for dynamic message signs, video and camera control, parking mgmt, and weather stations	ITE/ Foundation	ATMS data dictionary is used by traveler information systems that provide services to mobile users throughout the Nation.
High Speed Subcarrier (HSSC) **Layer 1**. *Status: Draft*	High speed FM subcarrier signaling system for wide-area data transfer for multiple applications, including traffic data for travelers and vehicles	NRSC/ National	Allows traveler information system messages to be broadcast to the traveler (i.e., vehicle) nationally.
Information Service Provider-Vehicle Location Referencing Standard [SAE J1746]. *Status: In ballot*	Standard location referencing format for information service provider to vehicle and vice versa. This standard will reflect the cross-streets profile of the current location referencing message set document.	SAE/ National, Foundation	Ensures consistency in location referencing and uniform processing for mobile users nationally; may interface with international standards.
Message Sets for DSRC, Electronic Toll and Traffic Mgmt and Commercial Vehicle Operations [IEEE P1455]. *Status: In ballot*	Standard for exchanging DSRC information in bidirectional message transmissions and device control; interfacing with, but independent of, the ASTM DSRC standards. Interface to other DSRC areas; e.g., electronic toll and traffic mgmt and commercial vehicle operations.	IEEE/ National	Provides message sets for other ITS user services, such as electronic toll and traffic mgmt and commercial vehicle operations.

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Message Sets for Incident Mgmt: Emergency Mgmt System to Traffic Mgmt System and to Emergency Telephone System (or 911) [IEEE P1512]. *Status: Draft*	To standardize the form and content of the incident mgmt messages sets for emergency mgmt systems (EMS) to traffic mgmt systems (TMS) and from emergency mgmt systems to the emergency telephone system (ETS) or (911).	IEEE/ National	Ensures consistency in communications to mobile users throughout the Nation; allows incident mgmt messages to be shared among different ITS systems.
(National Transportation Communications for ITS Protocol) **NTCIP Profile for Center-to-Center Communications-CORBA.** *Status: Draft*	Address real time peer-to-peer exchange (including some remote control/command capability) between transportation mgmt centers and systems such as traffic/transit operations centers, emergency mgmt centers, and traveler information systems using Common Object Request Broker Architecture	AASHTO/ National	Ensures data exchange among traffic centers, emergency mgmt centers, traveler information systems, and transit mgmt centers.
(National Transportation Communications for ITS Protocol) **NTCIP Profile for Center-to-Center Communications-DATEX**-ASN. *Status: Draft*	Address real time peer-to-peer exchange (including some remote control/command capability) between transportation mgmt centers and systems such as traffic/transit operations centers, emergency mgmt centers, and traveler information system using a predefined message transfer approach	AASHTO/ National	Ensures data exchange among traffic centers, emergency mgmt centers, traveler information systems, and transit mgmt centers.
NTCIP—Global Object Definitions [TS 3.4]. *Status: Published*	Identify and define those object definitions that may be supported by multiple device types, such as actuated signal controllers and variable message signs	AASHTO/ Foundation	Ensures that all objects (values and functions) are consistent in other NTCIP standards and in transit communications interface profiles (TCIP) standards.
NTCIP—Simple Transportation Mgmt Framework [TS3.2]. *Status: Approved*	Set of rules and protocols for organizing, describing, and exchanging transportation mgmt information between transportation mgmt applications and transportation equipment such that they interoperate	AASHTO/ National	Ensures uniform information exchange among transportation mgmt applications and sending/receiving equipment.
On-Board Land Vehicle Mayday Reporting Interface [SAE J2313]. *Status: In ballot*	Common specification for protocol methods enabling vendors to speak with response agencies in a standard format. Address message content for national consistency.	SAE/ National	Provides message and information between emergency mgmt centers and mobile users nationally.
Standard for Data Dictionaries for Intelligent Transportation Systems [IEEE P1489]. *Status:* In ballot	Common set of meta entities and meta attributes for ITS data dictionaries, as well as associated conventions and schemas. Enable describing, standardizing, and managing all ITS data. Allow data and information to be unambiguously exchanged among ITS functional subsystems through their specific application systems.	IEEE/ Foundation	Sets requirements for the attributes to be used by all ITS data dictionaries for unambiguous data transfer.
Standard Specification on Dedicates Short-Range Communications (**DSRC**) **Data Link Layer** [ASTM2]. *Status:* In ballot	Develop a specification for the protocol (data link) communications for DSRC. Support both active and backscatter transponders.	ASTM/ National	Allows DSRC systems to communicate between roadsides and vehicles nationally.
Dedicated Short-range Communications (**DSRC**) **Physical Layer**—902-928 MHz [ASTMI]. *Status:* In ballot	Develop a specification for the radio frequency characteristics (physical layer) for DSRC operation in the range of 902 to 928 MHz. Support both active and backscatter transponders.	ASTM/ National	Allows DSRC systems to communicate between roadsides and vehicles nationally.

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Title of standard	**Project objective**	**Lead SDO/ criticality**	**Rationale**
Template for ITS Message Sets [IEEE P1488]. *Status: Draft*	Develop a standard for an ITS Message Set Template	IEEE/ Foundation	Describe the structure/content of message sets for uniform and consistent exchange between traffic centers, emergency mgmt centers and traveler information systems.